

Grant Final Report

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**Development of Risk-Adjusted Outcome Measures In
the Electronic Health Record Environment**

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Abstract

Purpose: The conference examined issues related to the development of risk-adjusted outcome measures derived from data captured in an electronic health record (EHR) at the time of care. Outcome measures quantify the end result of an individual's encounter with the health care system. To compare providers performance accurately, outcome measures require risk adjustment. The introduction of the EHR is expected to provide new opportunities to access health outcomes and risk adjustment data.

Scope: a) Identify ways EHRs can be used to develop and enhance risk-adjusted outcome measures across the continuum of health care. b) Identify issues and barriers to using EHR data to develop risk-adjusted outcome measures, and explore how these barriers can be overcome. c) Use conference results to define a demonstration project to develop and test EHR-based risk-adjusted outcome measures.

Methods: Conference attendance was by invitation. Sixteen experts in outcome measure development, risk adjustment, and health information technology participated, along with one consumer stakeholder. The conference consisted of discussions on the three subject areas and facilitated brainstorming addressing the use of EHR data for risk-adjusted outcome measures.

Results: Participants were optimistic that developing risk-adjusted outcome measures utilizing EHR derived data would be feasible. However, they believe that quality improvement activities using EHR data are in their infancy and significant issues and barriers will have to be overcome. They agreed demonstration projects are necessary to identify solutions to these barriers.

Key Words: electronic health record (EHR); outcome measure; performance measurement; quality improvement; risk adjustment model

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Final Report

Purpose

The goal of this small conference grant was to convene a one and a half-day conference to address how data derived directly from an electronic health record (EHR) could be used to develop risk adjusted outcome measures. The primary purpose of the conference was to explore how EHR data can be utilized to develop new risk adjusted outcome measures across the continuum of health care and enhance current risk models developed for existing outcome measures.

Scope

Background

Health care outcomes reflect changes in a person's health status due to their health care system encounter. Outcome performance measures quantify the end results of health care services, and are a significant area of interest to stakeholders and consumers of health care. Although measuring health care outcomes is desirable, performance measurement to date has primarily focused on the processes of care because of the difficulties in locating and collecting accurate, comprehensive health outcomes data.

Outcome measures require risk adjustment to compare performance across providers and over time accurately and fairly. As a consequence, the quality and usefulness of an outcome measure depends on the quality of the risk adjustment model accompanying it. Risk adjustment is the process of taking patient-associated characteristics, known as risk factors (e.g., comorbidities, severity of illness, physiological status), into account in order to enable fair comparisons of outcomes across different patients, treatments, providers, or populations.

Context

The accelerated adoption of the electronic health record (EHR) across health care is expected to provide new opportunities to access and gather data upon which outcome measures can be based. These outcome measures can potentially be used in quality improvement, public reporting, pay-for-performance, oversight, and consumer decision-making.

Participants

Conference attendance was by invitation and included 16 experts in the fields of outcome measure development, risk adjustment methodology, and health information technology and

standards. In addition, one consumer stakeholder participated in the conference. See Appendix C for the List of Participants.

Methods

While outcome measurement and risk adjustment experts are familiar with each other's work, they are not as familiar with health information technology (HIT). At the same time HIT experts are, for the most part, not knowledgeable about the methodologies used to develop outcome measures and risk models. To enable full participation from all attendees, the first half-day was devoted to expert led presentations and discussions.

The presentations, in order, were:

Risk-Adjusting Measures of Health Outcomes: Why Bother?

Presented by Dr. Mark Chassin, President of The Joint Commission.

Dr. Chassin discussed the importance and uses of risk-adjusted outcome measures.

Introductory Thoughts on Outcome Measures

Presented by Dr. Patrick Romano, Professor of Medicine and Pediatrics at UC Davis School of Medicine.

Dr. Romano discussed the types and strengths of outcome measurement, and the concerns around using outcome measures.

Health IT & Quality: Where We Are & What's Next

Presented by Dr. Jacob Reider, Senior Policy Advisor of the Office of the National Coordinator for Health Information Technology.

Dr. Reider discussed EHR usability, defined as the effectiveness, efficiency and satisfaction with which users can achieve a specific set of tasks in a particular environment, and noted that the EHR doesn't capture the same information as paper records. How EHR usability is balanced with data capture has important implications for quality measurement. In addition, he discussed the current and future Meaningful Use regulations.

Quality Measurement Standards

Presented by Dr. Bob Dolin, Past Chair of Health Level Seven, President and Chief Medical Officer of Lantana Consulting Group.

Dr. Dolin discussed the national efforts surrounding the creation of health information technology standards. These standards will be used to define quality measures derived from EHR data (or an eMeasure), and to submit measurement data to quality monitoring organizations such as the Centers for Medicare and Medicaid Services and The Joint Commission.

EHR Implementation

Presented by Dr. J. Marc Overhage, Chief Medical Informatics Officer of Siemens Health Services, Siemens Medical Solutions USA, Inc.

Dr. Overhage discussed: EMR adoption statistics and the current utilization of available EHR functionality; the cost-value tradeoff and challenges of moving from paper data abstraction to rigidly structured data for EHR data capture; the ability to electronically infer structured meaning from a clinician's non-structured data input; and the purpose and uses of health information exchanges.

Risk Adjustment and the EHR

Presented by Dr. Stephen Schmaltz, Senior Biostatistician for The Joint Commission.

Dr. Schmaltz discussed: the need for risk adjusting outcome measures; statistical considerations that must be taken into account when performing risk adjustment; identification and selection of risk factors; and issues to consider when developing risk models.

These presentations set the stage for the second day of the conference which consisted of brainstorming sessions and discussions on how EHR data can be used to develop risk adjusted outcome measures. Throughout the second day, Joint Commission staff performed process checks with the meeting participants to ensure the discussions remained on track.

Results

While most participants were optimistic that data derived from an EHR for outcome measurement purposes will be feasible in the future, they recognized that the use of EHR data for this purpose is still in its infancy and significant issues and barriers will need to be overcome. The Table below reflects the output of the meeting discussions. It lists characteristics required to utilize EHR data for outcome measurement purposes, identifies implementation barriers, and proposes specific topics where further discussion is needed to define approaches and solutions.

Meeting participants recommended that The Joint Commission seek funding to conduct demonstration projects designed to make progress toward the development and use of risk adjusted outcome measures using EHR data, and identify solutions to the issues and barriers listed below. Attendees suggested a number of demonstration project ideas which will form the basis for proposals to AHRQ or other potential funders. In addition, the conference discussions

will be synthesized into a White Paper and made publicly available on The Joint Commission’s web site in early 2013.

Table 1. Required characteristics and barriers to implementation

Required Characteristics	Barriers to Implementation	Further Discussion on Proposed Approaches and Solutions
A functioning EHR.		
Outcomes measurement linked with clinical decision support.		Provide decision support guides for each outcome measure to effect desired action.
The ability to move from quality measurement to quality improvement.		
The ability for EHR-based outcome quality measurement to incorporate unstructured data.	The EHR does not capture data in the same way as paper medical records.	Structured data is more immediately useable and easily standardized compared to unstructured data but can be time consuming to collect and tends to interrupt the clinical work flow. Unstructured data, which better fits into the clinical work flow process, is a rich source of data for use in measurement but methodology needs to be developed to be able to accurately make use of these data.
		There is a cost/benefits trade-off with being able to access rich unstructured data and the cost of obtaining and being able to use these data.
		Create a mechanism for combining conflicting data, whether structured or unstructured.
		We can lose information, or possibly add noise, in the conversion of unstructured data to structured data.
		There are diminishing returns to the use of structured data since physicians tend to enter unstructured data into the EHR. There is a need to find out how we can utilize unstructured data and harvest information from other health information technology (HIT) software the provider has implemented.
		Incorporate natural language processing or machine learning to use unstructured EHR data in quality measurement.
A reduction in the chasm between the state of measurement science and EHR capability to generate standardized data for quality measurement.	There are disagreements about the definitions of eMeasures, data capture, data extraction, and data analysis.	Design methods to capture data in ways that meet the needs of all end users.
	Measurement science advances more quickly than HIT interoperability standards.	There will always be things to measure for which there is no standardized data capture. Are there other ways to get the data or will the quality improvement community have to live without it?
The ability to incorporate patient-reported data into the EHR for outcome measurement.	Patient-reported outcomes are not standardized.	Develop standards that address the capture of patient-reported outcomes so that the data can be used in an eMeasure.

Table 1. Required characteristics and barriers to implementation (continued)

Required Characteristics	Barriers to Implementation	Further Discussion on Proposed Approaches and Solutions
Movement beyond traditional risk factors for better, newer, broader outcome measures.	Lab data are not enough. Quality measurement and clinical decision support need additional data (e.g., vital signs) that are typically housed in HIT systems other than the EHR.	Focus needs to be on Health IT rather than the EHR because the EHR is only one potential data source.
		Data that are in administrative systems could also be incorporated in a hybrid model which incorporates both administrative and clinical data.
Incorporation of data from patient registries into the EHR so these can be used for developing risk adjusted outcomes measures.	There are no interoperability standards in place for incorporating data from patient registries into the EHR.	Continue to develop standards that promote and enhance reasonable coordination of health information exchange and quality measurement.
	There are silos between the data registry and the hospital, and within the hospital.	Continue to develop standards that promote and enhance reasonable coordination of health information exchange and quality measurement.
The ability of the EHR to transcend settings.	There are problems in mapping and translation when incorporating data from different sources into the EHR.	Need to determine how to move data, how to match patients, and how to approach issues of basic health information exchange.
		Need to normalize the representations enough to combine data from different sources.
		There is a balance between getting everything we want in the EHR and the use of data for making clinical decisions.
Quality and outcome measurement alignment with clinical workflow so that the EHR can help physicians identify processes of care that improve outcomes.		Enhance the capability requirements of the EHR or modify or reduce expectations; consider usability and work flow; rely on evidence that things happened rather than box checking; find ways to represent desired results systematically.
		The data need to be within the workflow and not be obstructive.
		Need to define what should happen within the clinical workflow for each eMeasure – alerts can be ignored or disabled if used too often.
Incorporation into the EHR of outcomes that would be useful at the time of care (e.g. functional status, quality of life, patient-reported outcomes).		Look at where someone else has demonstrated value and see if it can be replicated, going across different EHR vendors.
		When data are used, patients get better. Flag problems and make them transparent.
		Bring patients into the discussion so they can learn why their care is tied to their outcomes.
Existing paper-based measures that are retooled (adopted) into the EHR environment, harmonizing measures across different measure stewards.		Need to design and develop an approach for harmonizing measures.

Table 1. Required characteristics and barriers to implementation (continued)

Required Characteristics	Barriers to Implementation	Further Discussion on Proposed Approaches and Solutions
SNOMED-CT is used as a tool for quality measurement.	There is a lack of trained capacity in the quality measurement field for using SNOMED and other vocabularies.	Need more experience using SNOMED in quality measures to determine its impact on quality improvement. The vagaries of coding in the EHR have yet to be uncovered.
		Compare eMeasures that use SNOMED to analogous paper measures that use ICD-9 diagnosis codes.
The information infrastructure is able to support eMeasures.	The lack of an information infrastructure to support the efficient collection and use of EHR data for use in clinical practice, quality measurement, quality improvement, and population health.	Need to develop and implement the information infrastructure to support eMeasures.
The knowledge and ability to conduct research, develop quality eMeasures and interpret the results.	The lack of trained capacity in the quality measurement field to perform research, develop quality eMeasures, and to utilize the eMeasure data within the provider or hospital setting for quality improvement.	Need more training and experience using standardized EHR data in quality measures.
Documentation practices that are standardized across health care organizations.	There are differences in documentation between teaching and non-teaching hospitals that make it difficult to compare measures.	

Appendixes

Appendix A: Agenda—Development of Risk-Adjusted Outcome Measures in the EHR Environment AHRQ Funded Small Conference Joint Commission Board Room, Oakbrook Terrace, Illinois

Agenda, day 1 March 13, 2012 11:30 am - 5:00 pm

Event	Speaker(s)
11:30am – 12:30pm Welcome Lunch	
Introductions & Overview	Dr. Paul Schyve
Welcome & Stage Setting	Dr. Mark Chassin
Meeting Objectives	R. Koss and S. Schmaltz
Outcome Measures	Dr. Patrick Romano
EHR Technology and Standards	Dr. Jacob Reider Dr. Bob Dolin
<i>Break</i>	
EHR Implementation	Dr. J. Marc Overhage
Risk Adjustment	Dr. Stephen Schmaltz
Agenda Development - Day 2	Group
Discussion	Group
5:00pm Adjournment	

Tentative agenda, day 2 March 14, 2012 8:00 am - 5:00 pm

Event
8:00am – 8:30am Breakfast
Discussion: Create a conceptual framework for outcome measures and risk adjustment in the EHR world within the hospital setting. Identify issues, barriers and solutions for the following: <ul style="list-style-type: none"> • Outcome Data • Outcome Measures • Risk Adjustment
<i>Break</i>
Design the Future: <ul style="list-style-type: none"> • Where can outcome measure development be in the next 2, 5 and 10 years?
<i>Lunch</i>
Demonstration Project <ul style="list-style-type: none"> • Define • Outline • Plan
Meeting Evaluation
5:00pm Adjournment

Appendix B: Conference Objectives

Specific Objectives

To date, performance measurement efforts have primarily focused on the processes of care, due largely to the difficulties in locating and collecting accurate and comprehensive data on health outcomes. The introduction of the electronic health record (EHR) across the broad spectrum of health care is expected to provide new opportunities to access and gather data upon which outcome measures can be based. Health care outcomes reflect changes in a person's health status as a result of their health care system encounter. Outcome performance measures quantify the end results of health care services, and they are a significant area of interest to stakeholders and the consumers of health care.

Risk adjustment is the process of taking patient-associated characteristics, known as risk factors (e.g., co-morbidities, severity of illness, physiological status), into account in order to enable fair comparisons of outcomes across different patients, treatments, providers, or populations. The usefulness of an outcome measure is dependent upon the quality of the risk adjustment model accompanying it.

As the EHR is now in the beginning stages of universal implementation, the time is right to consider how data from the EHR might be used to develop risk adjusted outcome measures. As adoption of the EHR continues to expand across the health care environment, risk adjusted outcome measures will become available for use in quality improvement, public reporting, pay-for-performance, oversight and consumer decision-making.

This invitational conference will convene experts in outcome measures, risk adjustment models and the EHR to:

- Objective 1: Identify ways that the EHR can be used to develop new risk adjusted outcome measures across the continuum of health care.
- Objective 2: Identify ways that the EHR can be used to enhance current risk models that have been developed for existing outcomes measures.
- Objective 3: Identify the challenges and barriers to using EHR data in the development of risk adjusted outcome measures, and explore how these barriers can be overcome.
- Objective 4: Use the results of the conference to form the basis of a demonstration project during which risk adjusted outcome measures will be developed and tested using EHR data.
- Objective 5: Widely disseminate the knowledge and information gathered from the conference through a white paper.

The results of the conference will help inform the process of establishing standardized risk adjusted outcomes measures in the EHR environment. Providers and stakeholders can use these measures for internal quality improvement activities. At the public policy level, the results will

facilitate national comparisons of performance which can inform public and private efforts to enhance consumer choice and provider accountability.

Appendix C: List of Participants

Joint Commission staff list

<p>Stephen P. Schmaltz, PhD, MPH Project Investigator Senior Biostatistician Associate Director Department of Health Services Research Division of Healthcare Quality Evaluation</p>	<p>Paul M. Schyve, MD Conference Moderator Senior Advisor Healthcare Improvement</p>
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<p>Richard Koss, MA Director Department of Health Services Research Division of Healthcare Quality Evaluation</p>	<p>Scott Williams, PsyD, MA Associate Director Department of Health Services Research Division of Healthcare Quality Evaluation</p>
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Conference participant list (continued)

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Appendix D: Evaluation Summary

Conference Participant's Evaluation Summary

Total respondents 4 of 16 (25% response rate)

1. Please rate your overall satisfaction with the conference. [5 Option Rating Scale: Very Dissatisfied, Dissatisfied, Neutral, Satisfied, Very Satisfied]
 - Very Satisfied – 2
 - Satisfied – 2
2. Please rate your level of agreement that each of the aims below was met. [5 Option Rating Scale: Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree]
 - a. Identify ways that the EHR can be used to develop new risk adjustment outcome measures across the continuum of health care.
 - Strongly Agree – 1
 - Agree – 3
 - b. Identify ways that the EHR can be used to enhance current risk models that have been developed for existing outcome measures.
 - Agree – 4
 - c. Identify the challenges and barriers to using EHR data in the development of risk adjusted outcome measures, and explore how these barriers can be overcome.
 - Strongly Agree – 2
 - Agree – 2
3. What aspects of this conference were most valuable for you?
 - The range of roles represented in the room. Basically, I found it valuable.
 - The mix of participants is excellent. The discussions were very rich and the moderation kept discussion focused.
 - Open ended conference

- Discussion among experts. Great group of experts.
4. What aspects of this conference could be improved?
- We should have known that everyone would be brain-dead by 3pm on the 2nd day.
 - Travel plans could have been made more efficiently.
 - Perhaps we should have tried to draft a next-steps document.
 - I felt that innovative methods, that I could have suggested, were not received. Hopefully it will be possible to add to the report.